A synthesis of geometric relationships and structural elements within the Voisey's Bay Ni-Cu-Co deposits

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The Voisey's Bay Ni-Cu-Co sulphide deposit occurs within troctolites and olivine gabbros of the 1.34 Ga. Voisey's Bay Intrusion. The Voisey's Bay Intrusion is a member of the Nain Plutonic Suite and straddles the ca. 1.85 Ga. suture between Archean orthogneisses of the Nain Province to the east and Paleoproterozoic paragneisses of the Churchill Province to the west.

The Reid Brook, Discovery Hill, Mini-Ovoid and Ovoid zones occur within a sub-vertical conduit dike system. The conduit appears to span two large troctolite intrusions, the Eastern Deeps chamber and the lower Western Deeps chamber. East of the Ovoid, mineralization is not found within subvertical domains, but occur in sub-horizontal sill-like intrusions branching from the sub-vertical dike intersecting the Eastern Deeps chamber. At Voisey's Bay, the distribution of sulphides and the morphology of the conduits appear to be controlled by the geometrical relationships produced between specific geological structures. The plunge of the conduit is coincident with an intersection lineation produced between the local gneissosity and prominent east-west lineaments. Within the sub-vertical domain of the conduit, the plunge of the mineralization is defined by intersecting lineations created between the adjacent orthogneiss and paragneiss fabrics. Furthermore, the Eastern Deeps deposit, located at the base of the Eastern Deeps chamber, occurs along an east-southeast trending structural trough constrained by two regional east-west lineaments.

Although magmatic processes generated the sulphides observed at Voisey's Bay, the morphology of the conduits and the amount of mineralization contained within them are controlled by geometric relationships formed between prominent structural elements.